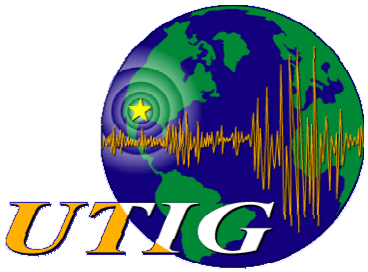


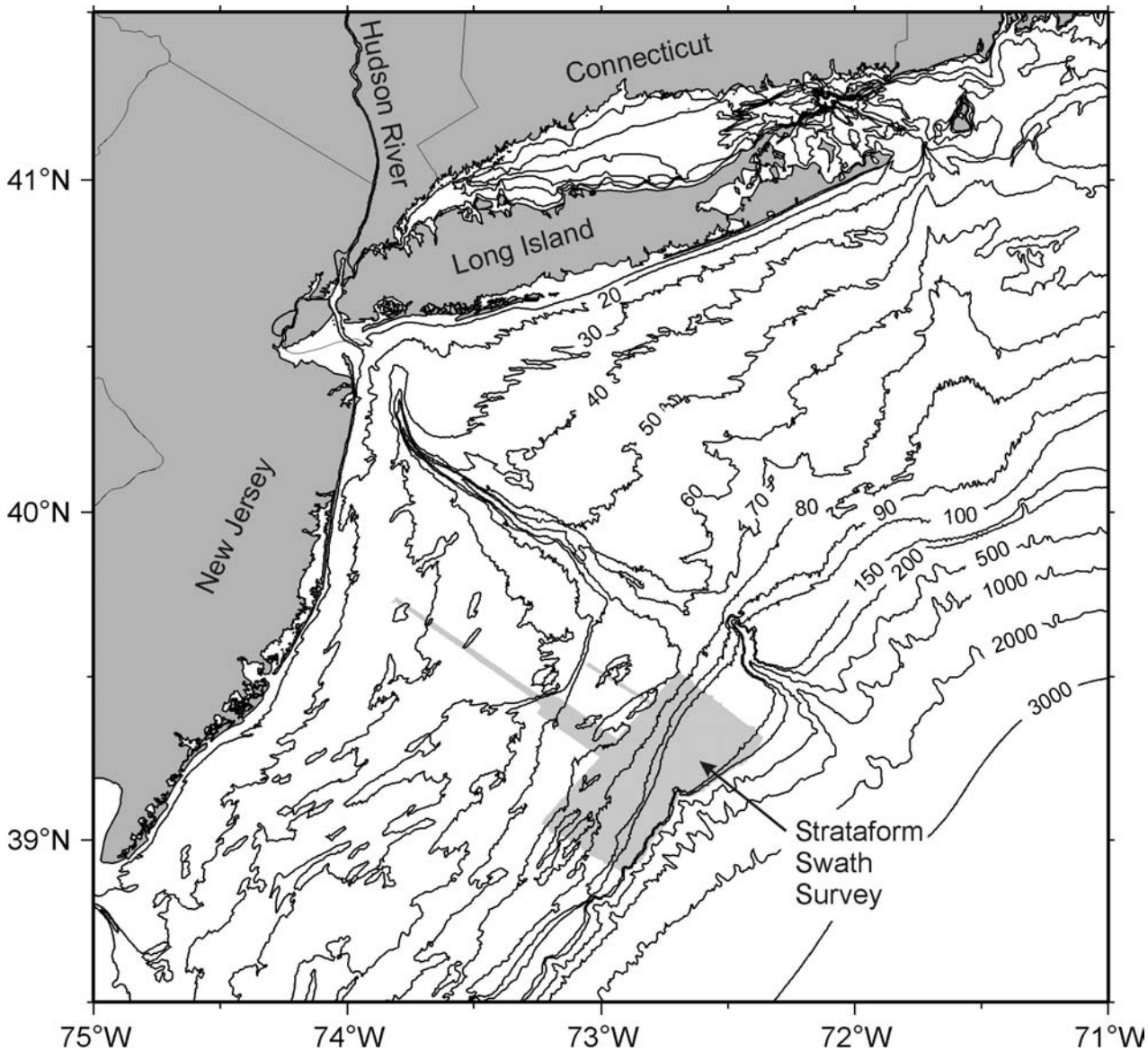
Correlability and Spatial Variability of Seafloor Sediment Properties in the STRATAFORM Natural Laboratories (New Jersey and N. California)

John A. Goff

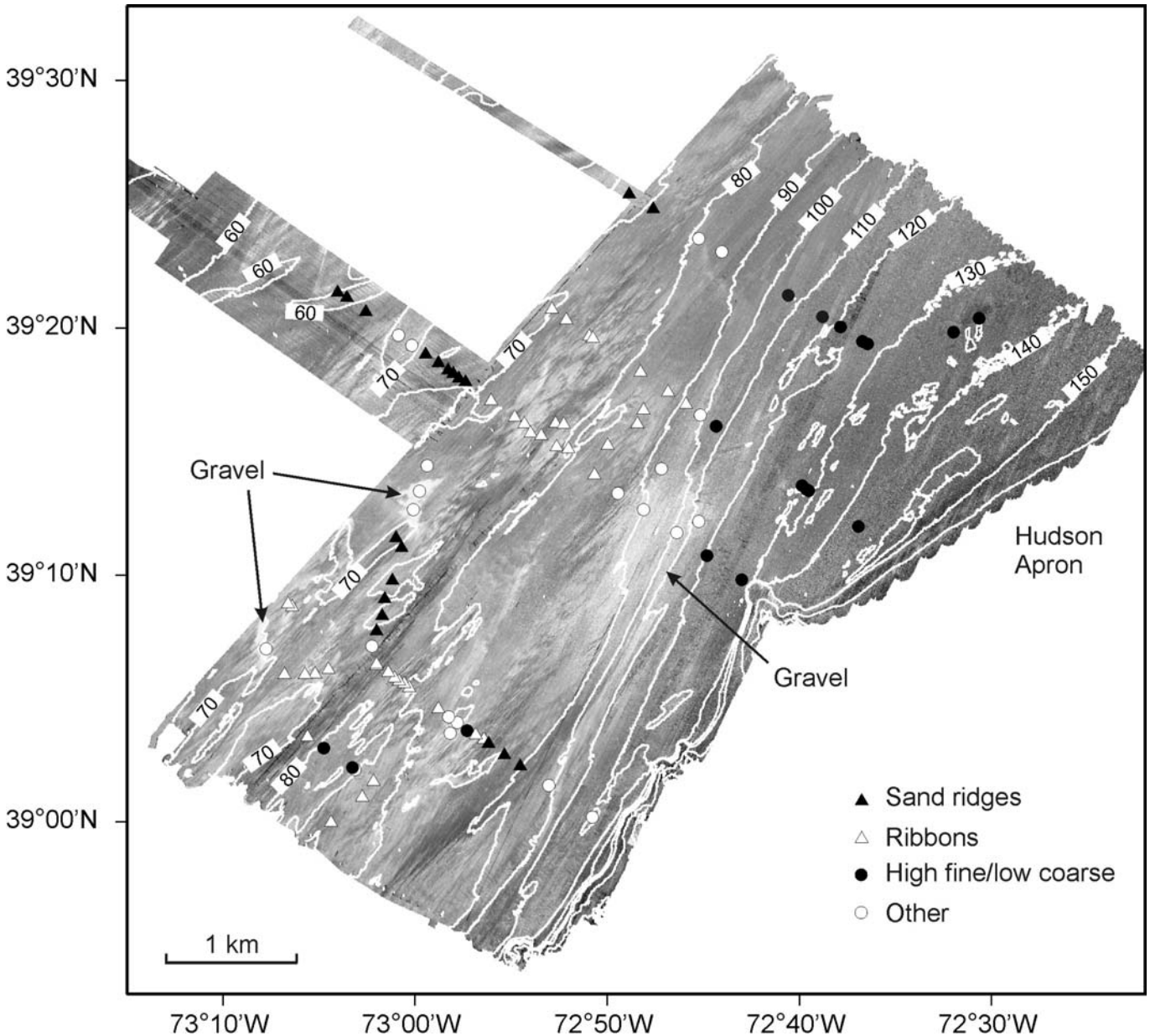
University of Texas Institute for Geophysics

Contributors: Barbara Kraft, Larry Mayer, Sean Gulick, Hilary Olson, Sylvia Nordfjord, Chris Sommerfield Homa Lee, Rob Wheatcroft, Dave Drake, Don Swift, Shejun Fan

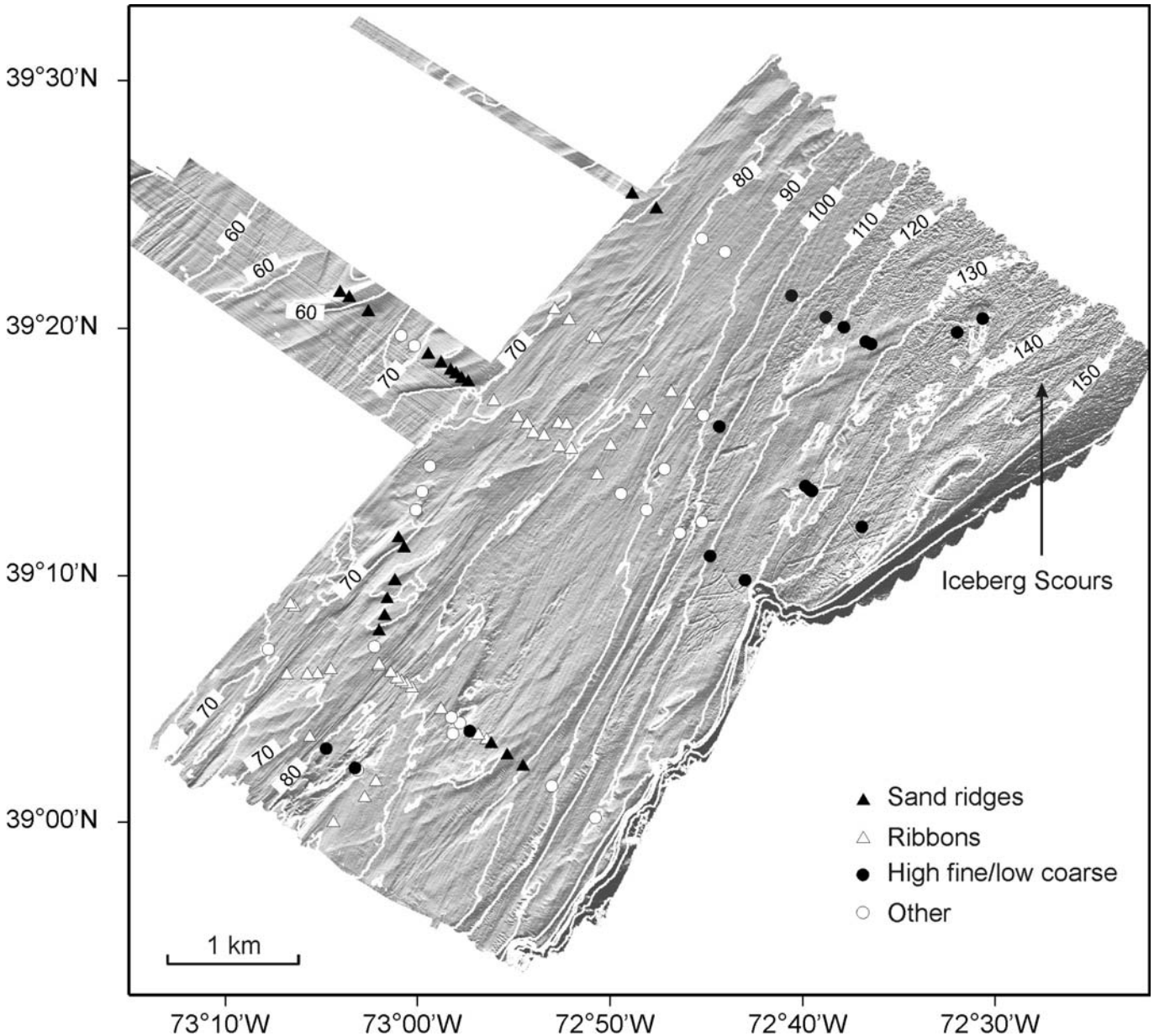
The New Jersey Shelf



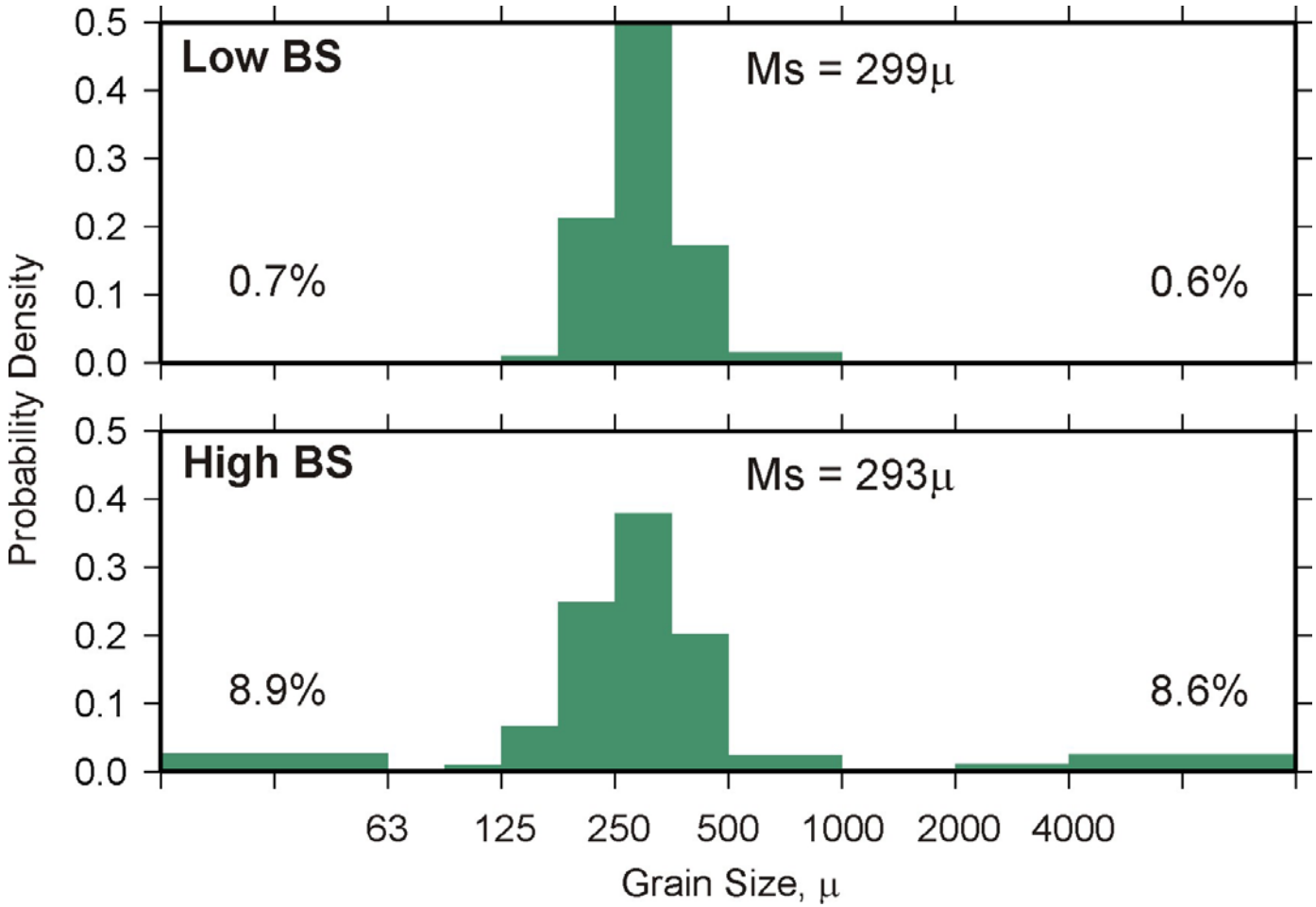
STRATAFORM Sidescan Data



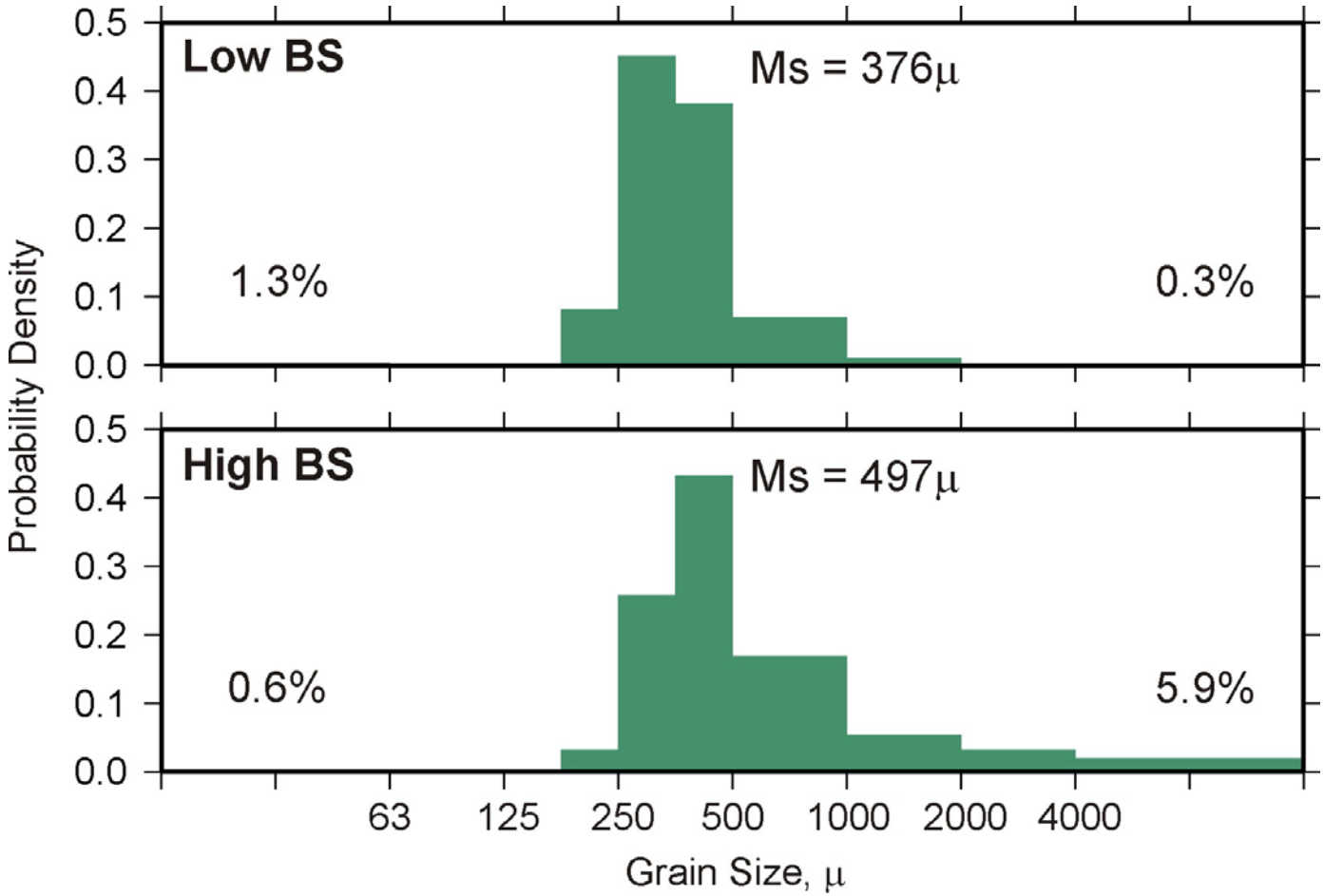
STRATAFORM Swath Bathymetry



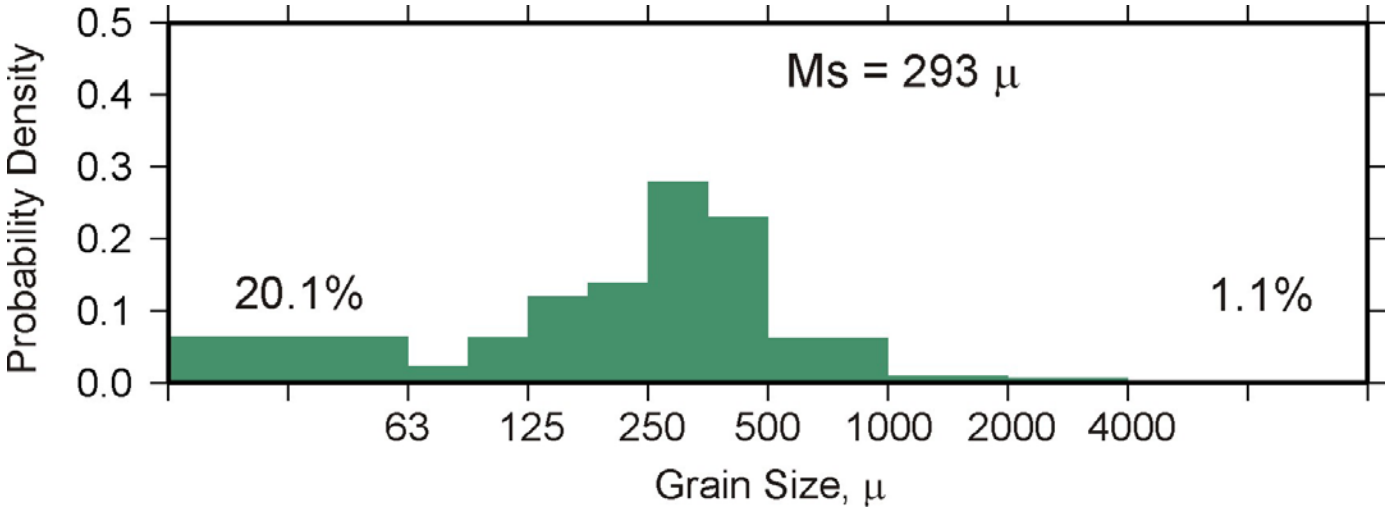
Grain Size Histograms: Ribbons



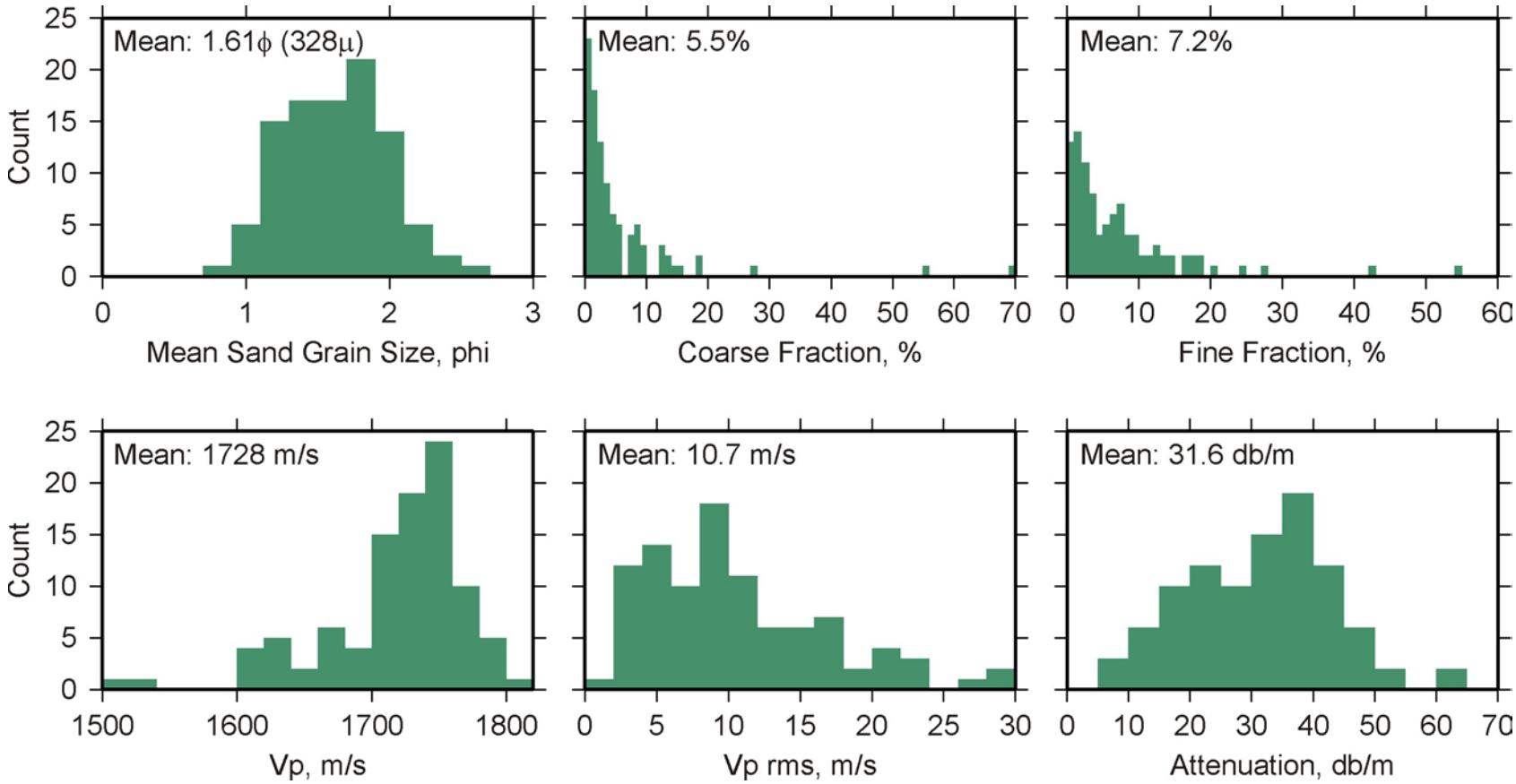
Grain Size Histograms: Sand Ridges



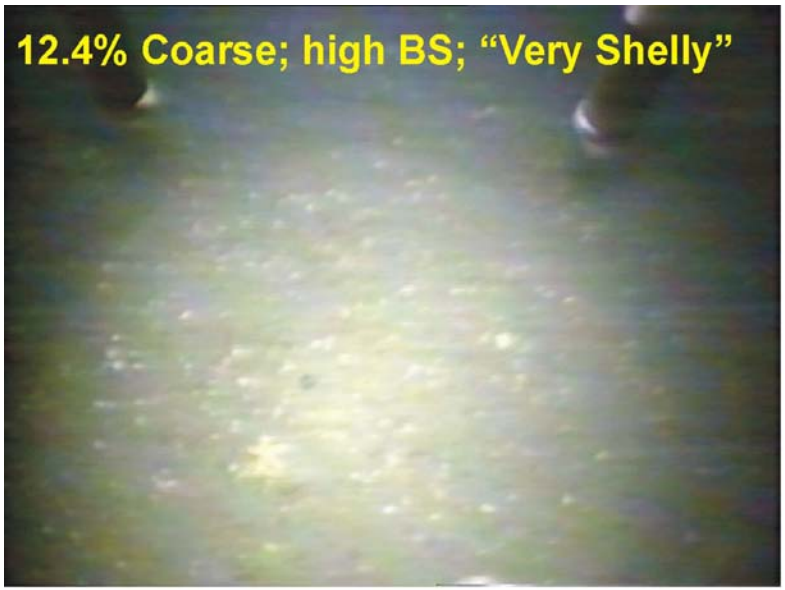
Grain Size Histogram: High Clay/Low Coarse

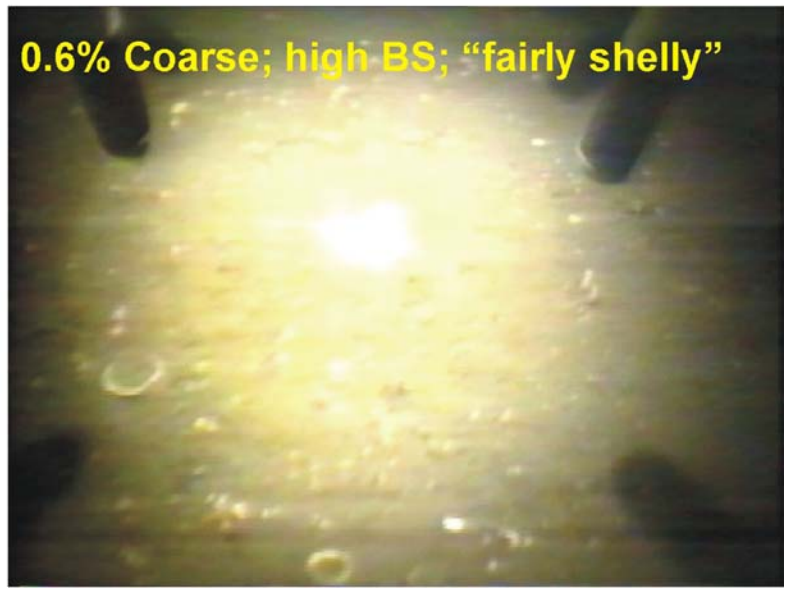


Parameter Histograms

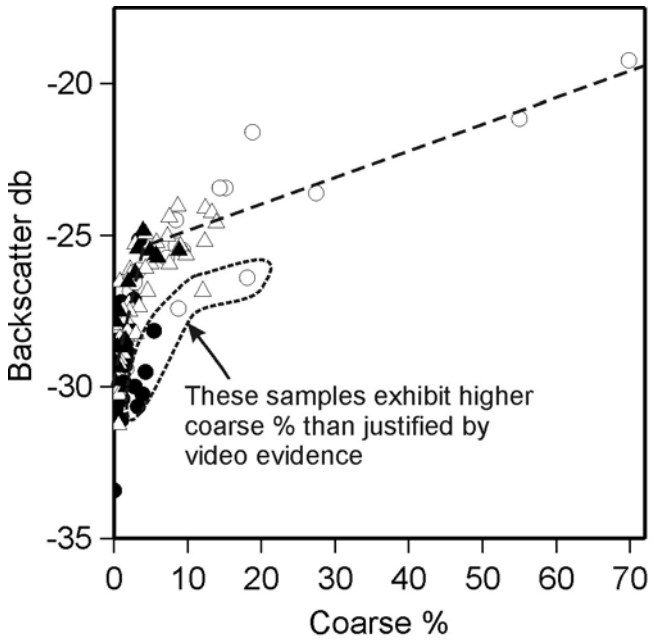


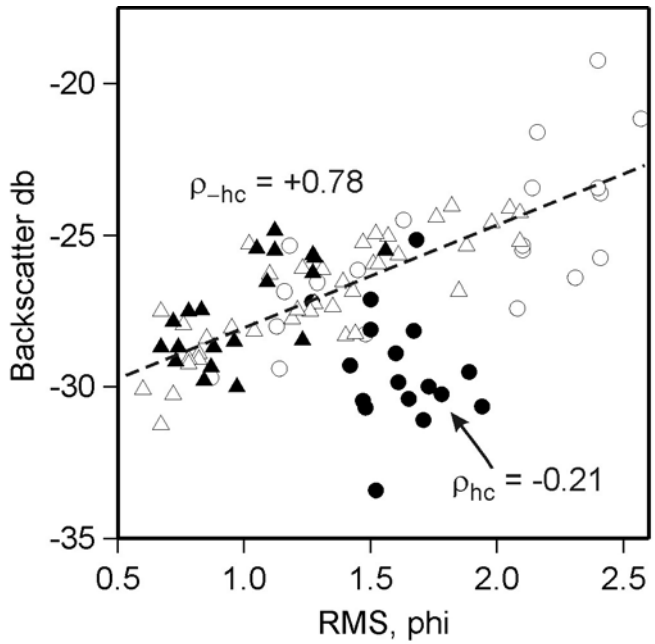
Visual Check on Coarse %

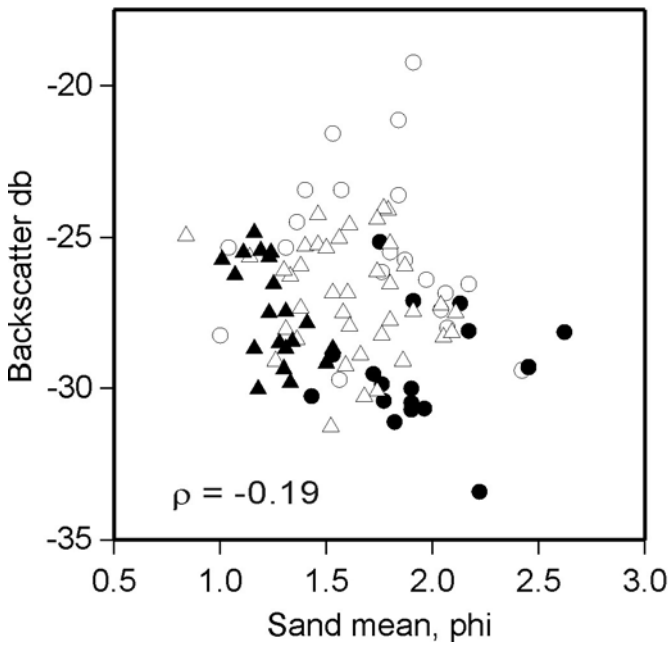


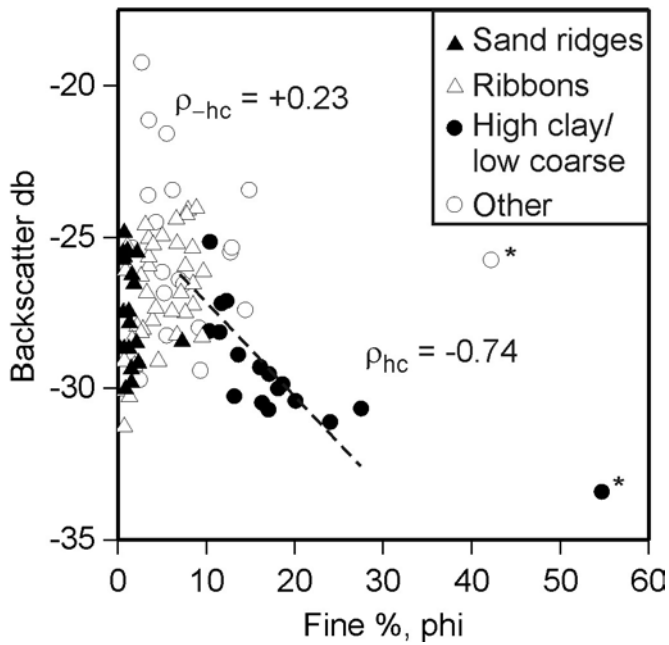


Backscatter and Grain Size

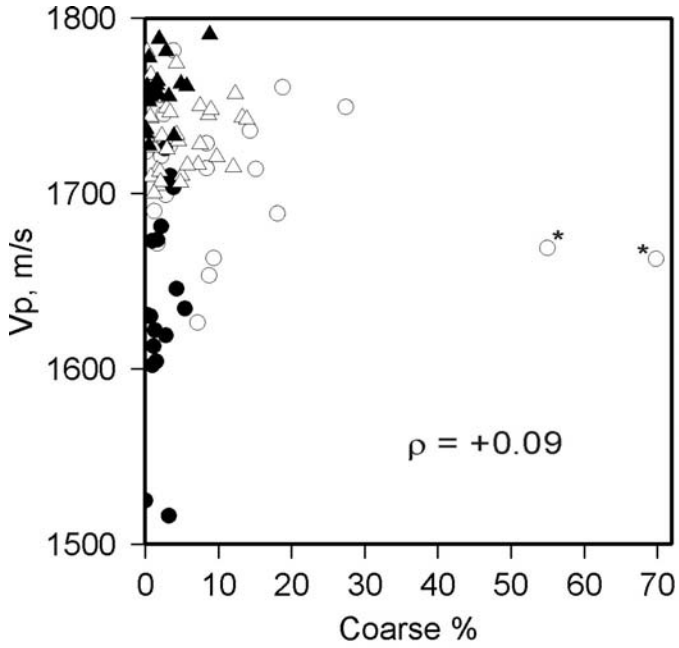


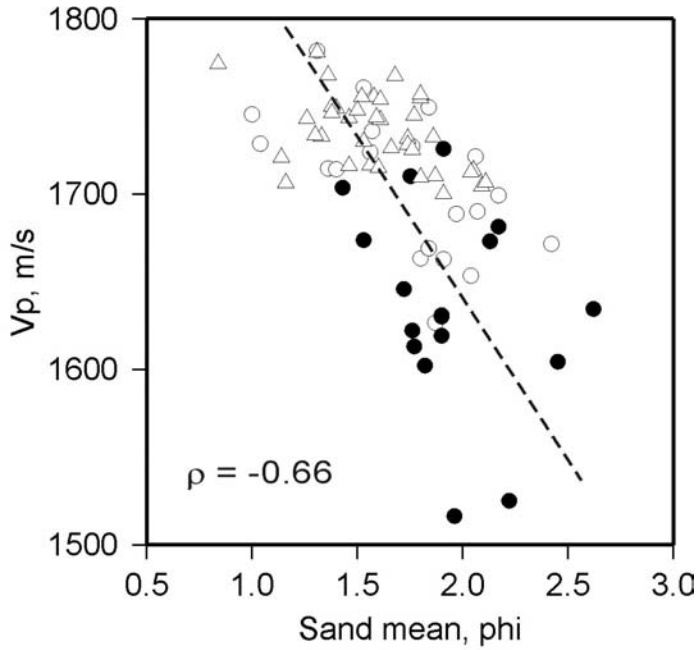


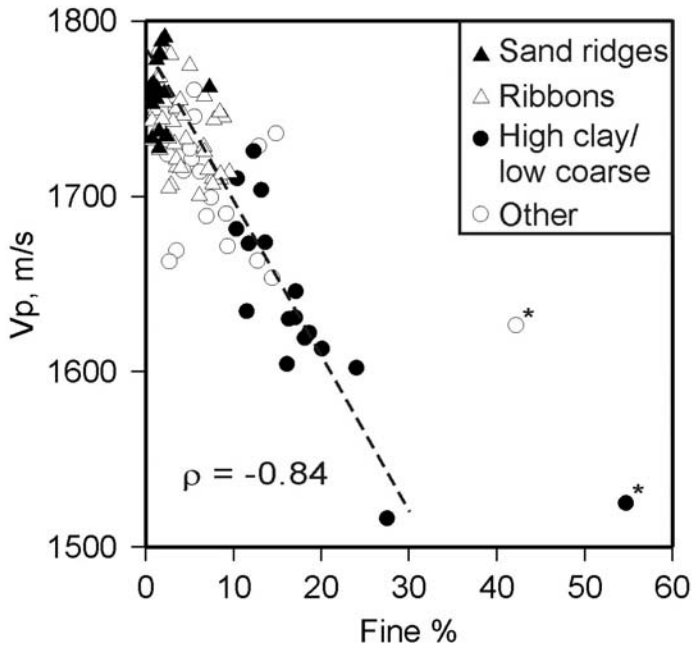




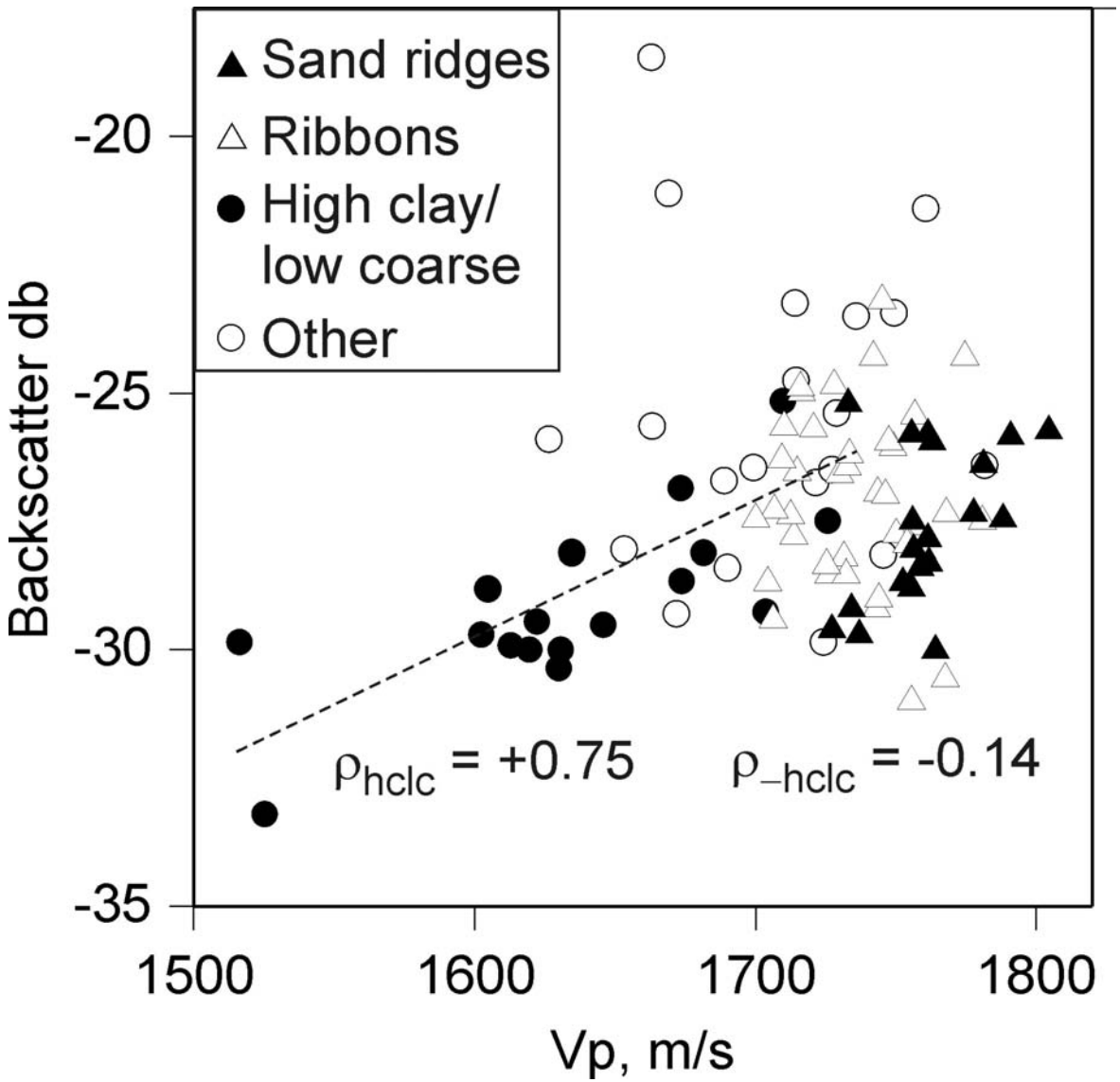
Velocity and Grain Size



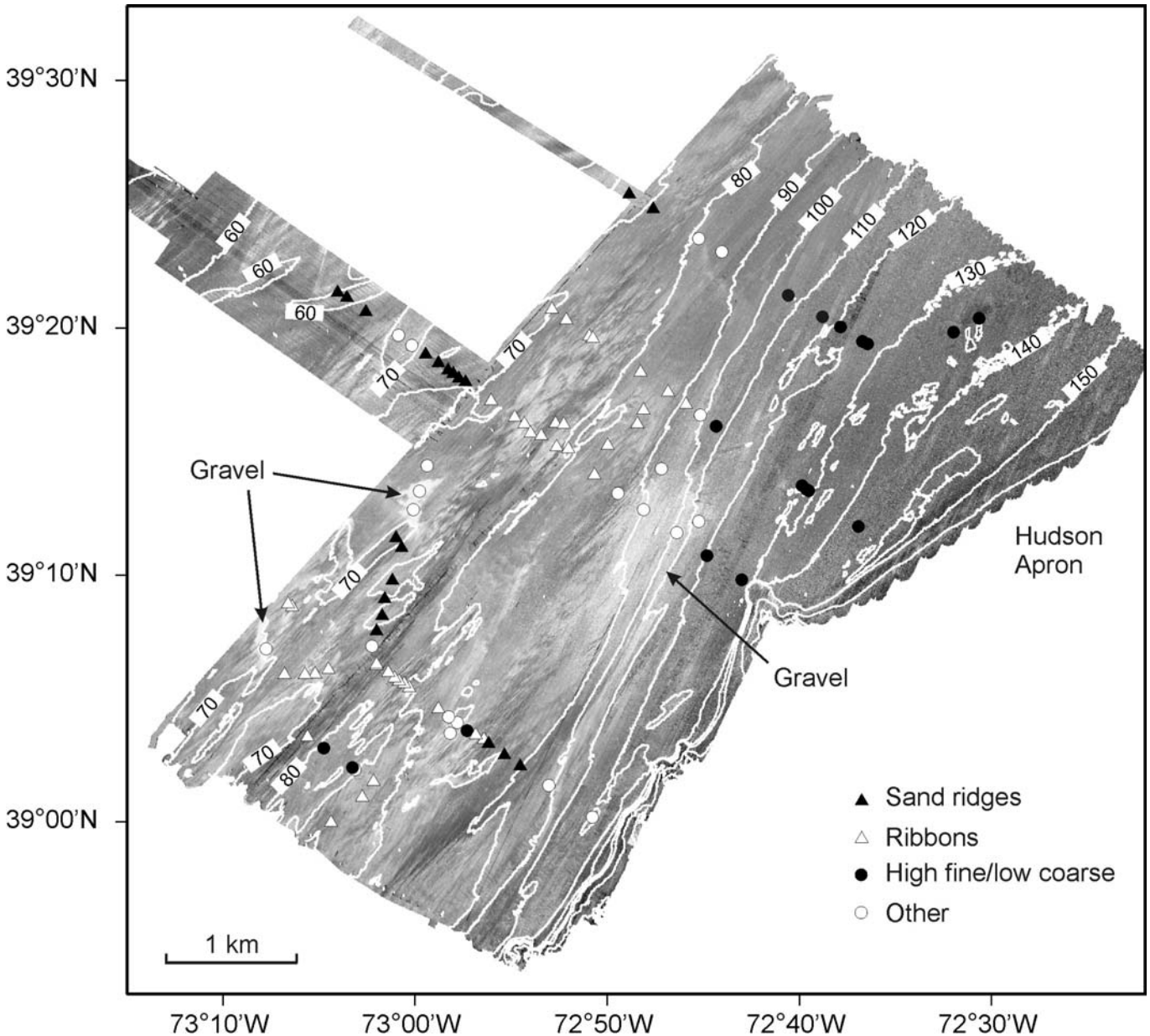




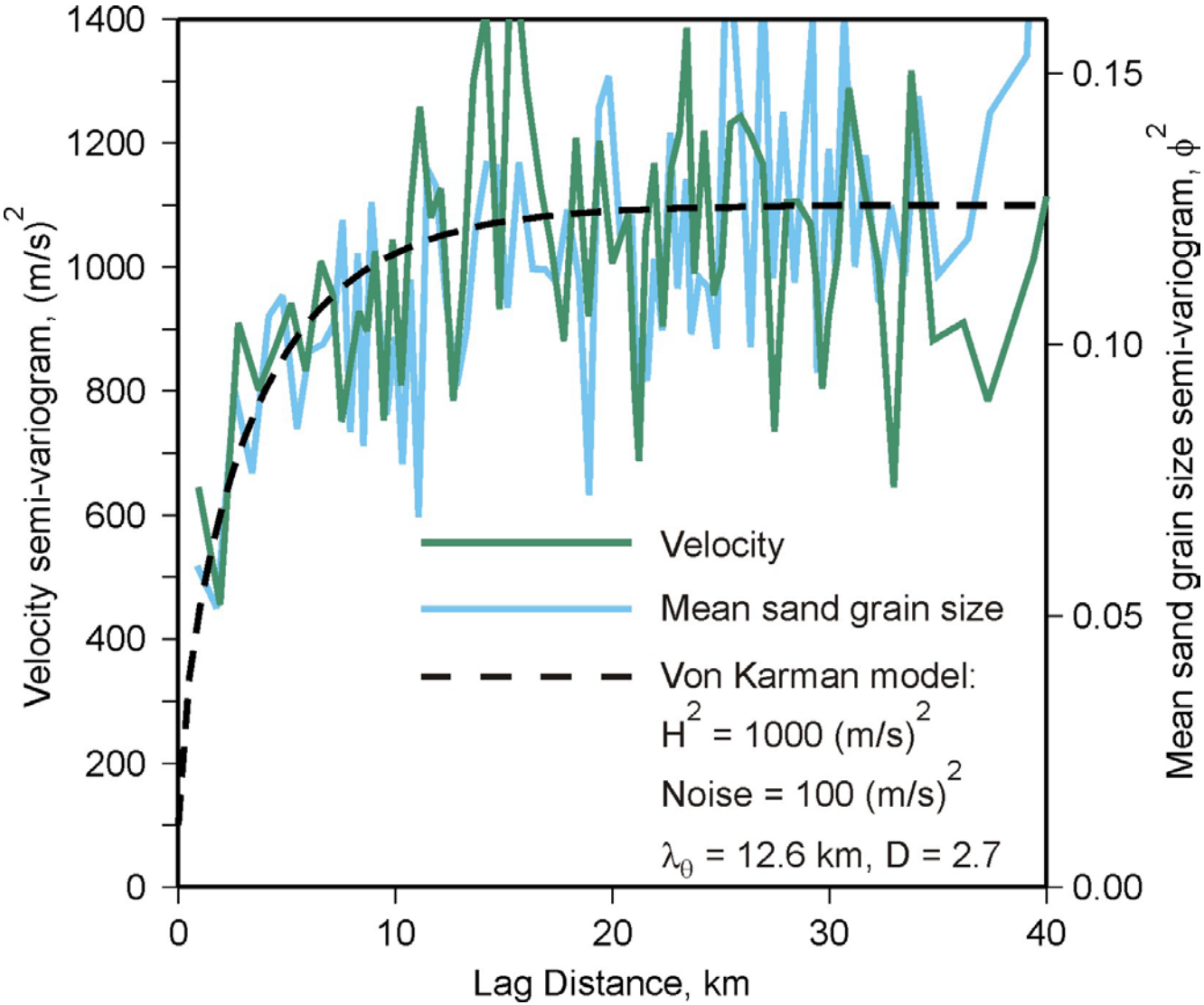
Backscatter vs. Velocity



STRATAFORM Sidescan Data

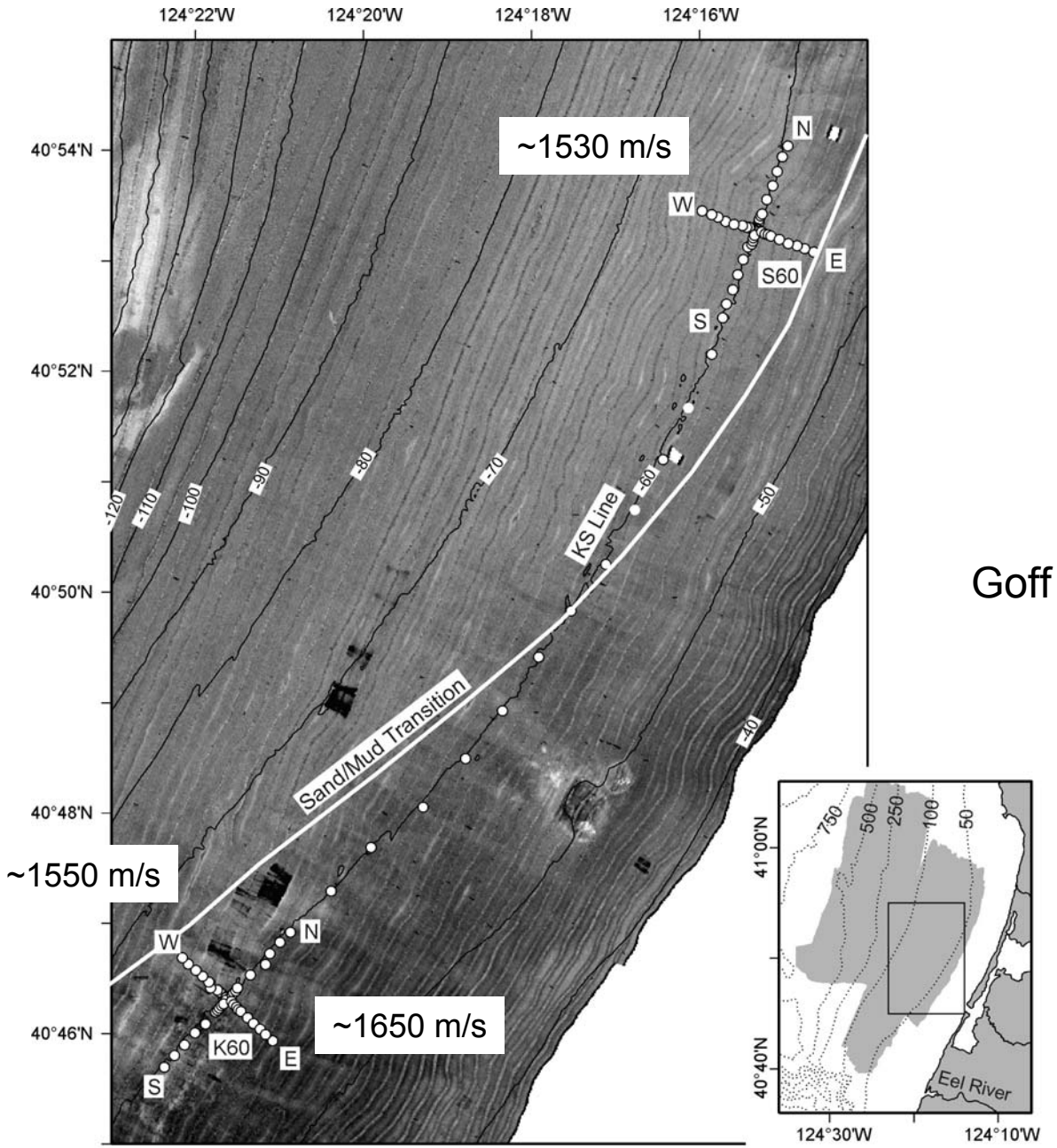


Semi-Variogram Analysis: velocity & mean sand grain size



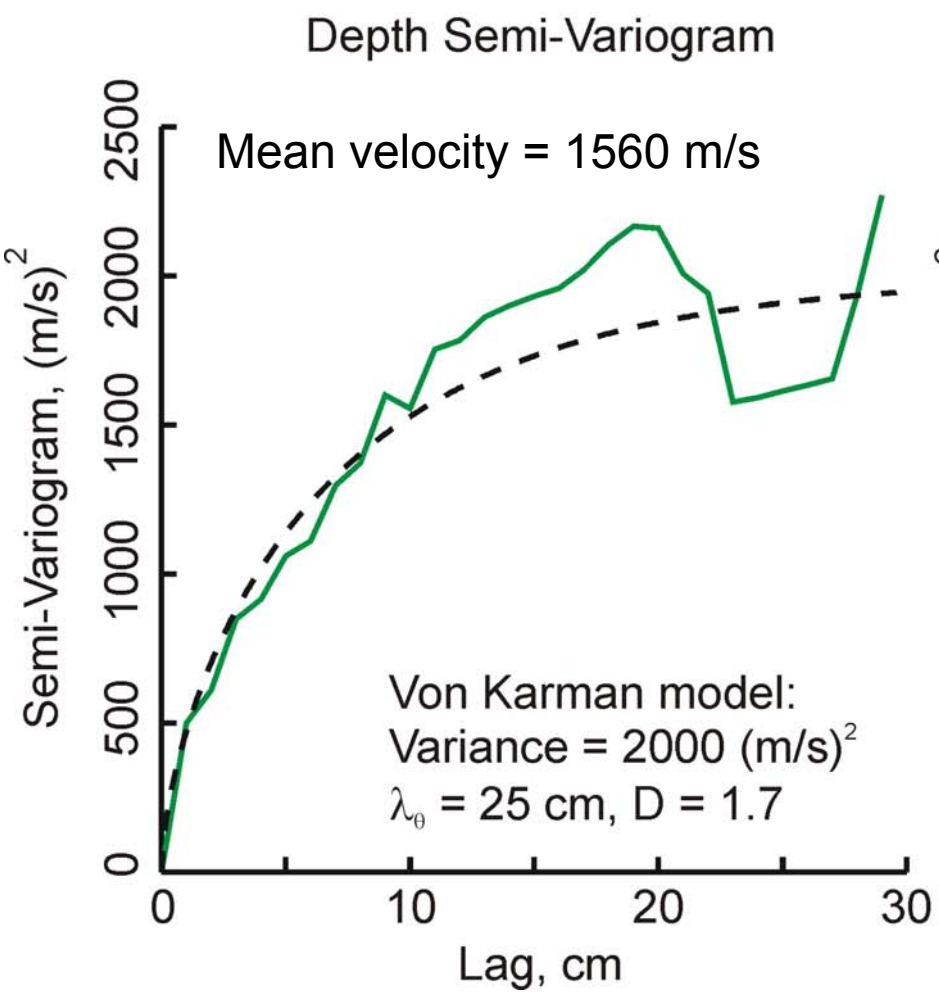
Mean Velocity = 1728 m/s

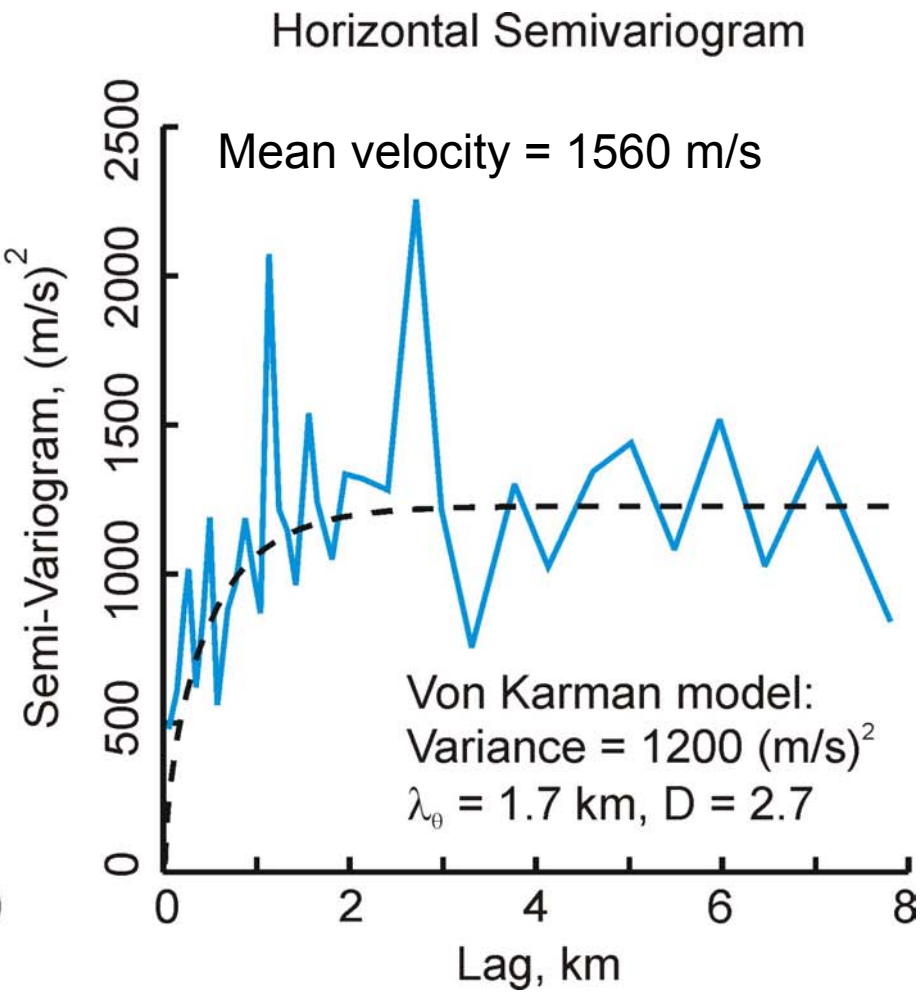
Eel Margin, N. California



Goff et al., 2002

Semi-Variogram Analysis for Eel Margin Muddy Sediments

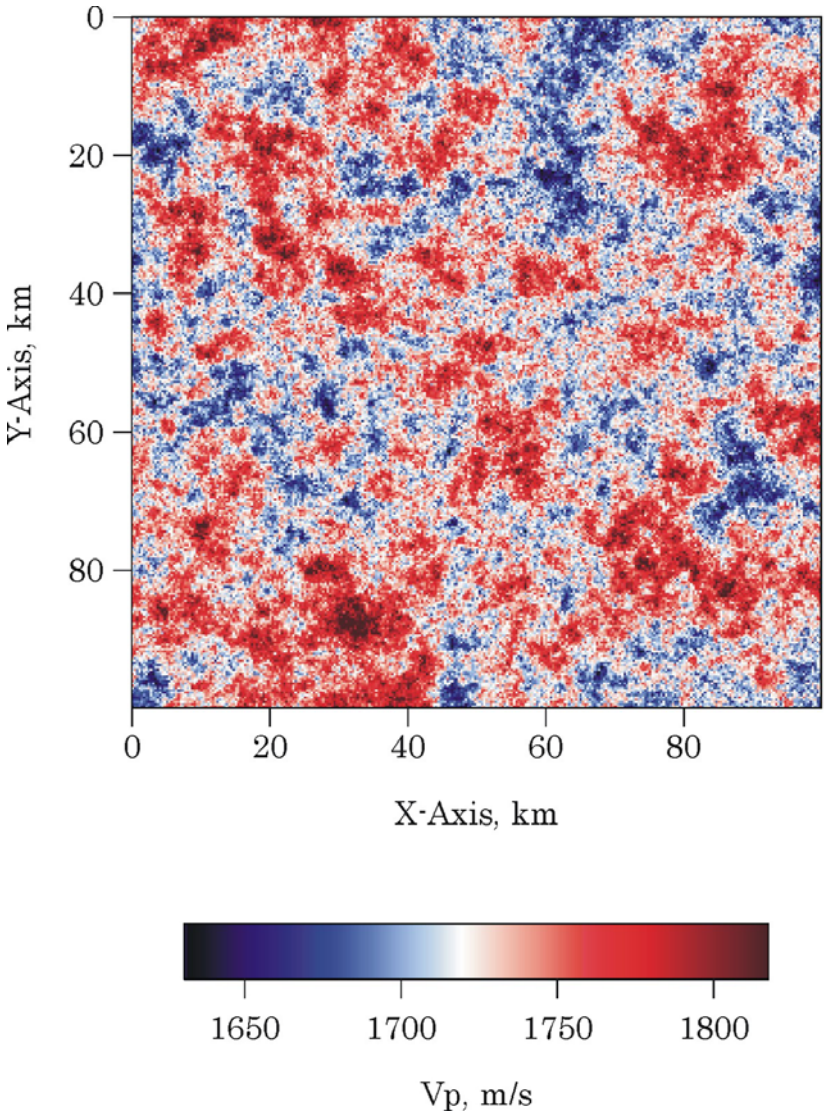




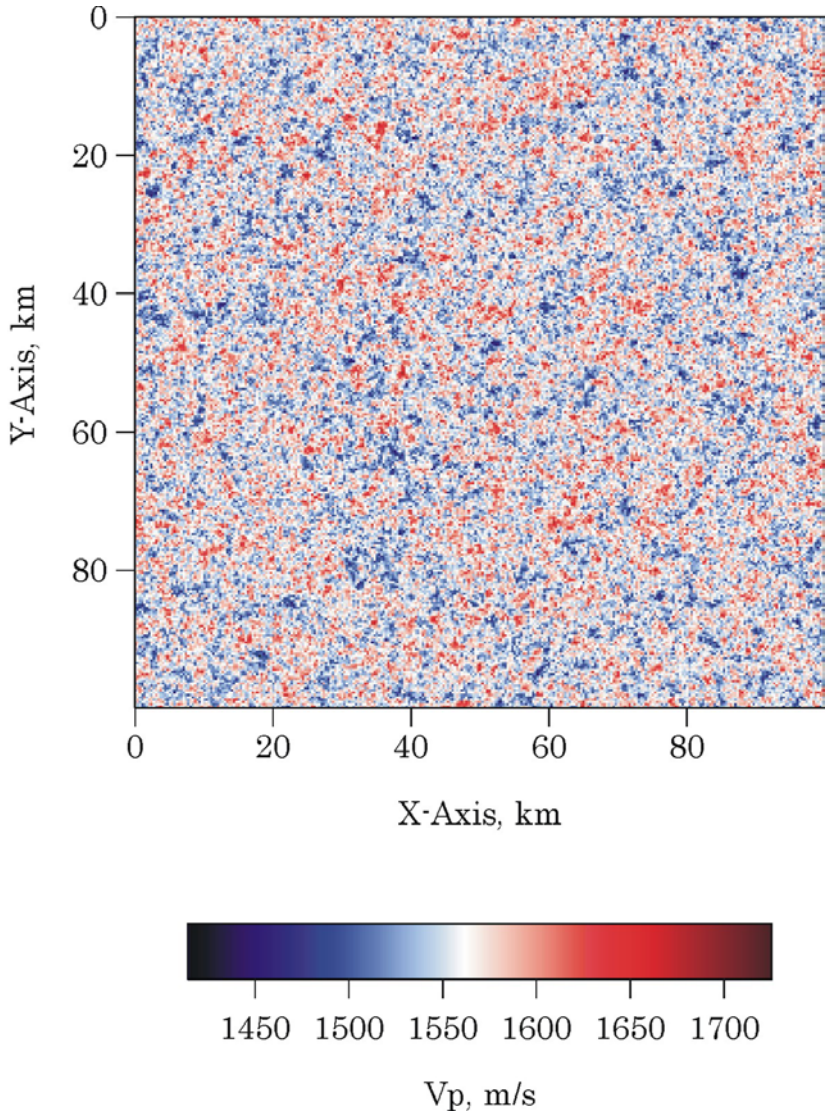
Horizontal model for NJ shelf:
Variance = 1000 (m/s)^2
λ_θ = 12.6 km, D = 2.7
Mean velocity = 1728 m/s

Synthetic Velocity Fields – 2-D Horizontal

New Jersey Margin



Eel Margin



Conclusions

- Where coarse % is significant (>5%), backscatter is dominated by coarse material at seafloor. Otherwise, backscatter is correlatable to bulk properties.
- Velocity is related to sand grain size and fine %.
- Spatial variability of velocity follows a simple scale-bounded (von Karman) fractal model with moderately high fractal dimension (~2.7).
- Velocity measurements from the sandy sediments of the New Jersey shelf exhibit a mean of 1728 m/s, rms of 33 m/s, and horizontal correlation length scale of 12.6 km.
- Velocity measurements from the muddy sediments of the Eel margin exhibit a mean of 1560 m/s, rms of 35 m/s, and horizontal correlation length scale of 1.7 km. In the vertical, a higher rms of 45 m/s is observed with correlation length scale of 25 cm.